FJP13009
High-Voltage Fast-Switching NPN Power Transistor

Features

• High-Voltage Capability
• High Switching Speed

Applications

• Electronic Ballast
• Switching Regulator
• Motor Control
• Switched Mode Power Supply

Description

The FJP13009 is a 700 V, 12 A NPN silicon epitaxial planar transistor. The FJP13009 is available with multiple $h_{FE}$ bin classes for ease of design use. The FJP13009 is designed for high speed switching applications which utilizes the industry standard TO-220 package offering flexibility in design and excellent power dissipation.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number(1)</th>
<th>Top Mark</th>
<th>Package</th>
<th>Packing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>FJP13009TU</td>
<td>J13009</td>
<td>TO-220 3L</td>
<td>Rail</td>
</tr>
<tr>
<td>FJP13009H2TU</td>
<td>J13009-2</td>
<td>TO-220 3L</td>
<td>Rail</td>
</tr>
</tbody>
</table>

Notes:

1. The affix "-H2" means the $h_{FE}$ classification. The suffix "-TU" means the tube packing method.
Absolute Maximum Ratings (2)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at $T_C = 25^\circ C$ unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CBO}$</td>
<td>Collector-Base Voltage</td>
<td>700</td>
<td>V</td>
</tr>
<tr>
<td>$V_{CEO}$</td>
<td>Collector-Emitter Voltage</td>
<td>400</td>
<td>V</td>
</tr>
<tr>
<td>$V_{EBO}$</td>
<td>Emitter-Base Voltage</td>
<td>9</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current (DC)</td>
<td>12</td>
<td>A</td>
</tr>
<tr>
<td>$I_{CP}$</td>
<td>Collector Current (Pulse)</td>
<td>24</td>
<td>A</td>
</tr>
<tr>
<td>$I_B$</td>
<td>Base Current</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Total Device Dissipation ($T_C = 25^\circ C$)</td>
<td>100</td>
<td>W</td>
</tr>
<tr>
<td>$T_J$</td>
<td>Junction Temperature</td>
<td>150</td>
<td>$^\circ C$</td>
</tr>
<tr>
<td>$T_{STG}$</td>
<td>Storage Temperature Range</td>
<td>-65 to +150</td>
<td>$^\circ C$</td>
</tr>
</tbody>
</table>

Note:
2. These ratings are based on a maximum junction temperature of $150^\circ C$. These are steady-state limits. Fairchild Semiconductor should be consulted on application involving pulsed or low-duty-cycle operations.

Electrical Characteristics

Values are at $T_C = 25^\circ C$ unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CEO(sus)}$</td>
<td>Collector-Emitter Sustaining Voltage</td>
<td>$I_C = 10 \text{ mA}, I_B = 0$</td>
<td>400</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$I_{EBO}$</td>
<td>Emitter Cut-Off Current</td>
<td>$V_{EB} = 9 \text{ V}, I_C = 0$</td>
<td></td>
<td>1</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>$h_{FE1}$</td>
<td>DC Current Gain(3)</td>
<td>$V_{CE} = 5 \text{ V}, I_C = 5 \text{ A}$</td>
<td>8</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$h_{FE2}$</td>
<td></td>
<td>$V_{CE} = 5 \text{ V}, I_C = 8 \text{ A}$</td>
<td>6</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CE(sat)}$</td>
<td>Collector-Emitter Saturation Voltage(3)</td>
<td>$I_C = 5 \text{ A}, I_B = 1 \text{ A}$</td>
<td>1.0</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 8 \text{ A}, I_B = 1.6 \text{ A}$</td>
<td>1.5</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 12 \text{ A}, I_B = 3 \text{ A}$</td>
<td>3.0</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{BE(sat)}$</td>
<td>Base-Emitter Saturation Voltage(3)</td>
<td>$I_C = 5 \text{ A}, I_B = 1 \text{ A}$</td>
<td>1.2</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_C = 8 \text{ A}, I_B = 1.6 \text{ A}$</td>
<td>1.6</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$C_{ob}$</td>
<td>Output Capacitance</td>
<td>$V_{CB} = 10 \text{ V}, f = 0.1 \text{ MHz}$</td>
<td>180</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>$f_T$</td>
<td>Current Gain Bandwidth Product</td>
<td>$V_{CE} = 10 \text{ V}, I_C = 0.5 \text{ A}$</td>
<td>4</td>
<td></td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td>$t_{ON}$</td>
<td>Turn-On Time</td>
<td>$V_{CC} = 125 \text{ V}, I_C = 8 \text{ A}$,</td>
<td></td>
<td>1.1</td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_B1 = I_B2 = 1.6 \text{ A}$, $R_L = 15.6 \Omega$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{STG}$</td>
<td>Storage Time</td>
<td></td>
<td>3.0</td>
<td></td>
<td>μs</td>
<td></td>
</tr>
<tr>
<td>$t_f$</td>
<td>Fall Time</td>
<td></td>
<td>0.7</td>
<td></td>
<td>μs</td>
<td></td>
</tr>
</tbody>
</table>

Note:
3. Pulse test: pulse width $\leq 300 \mu s$, duty cycle $\leq 2\%$

$h_{FE}$ Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>$h_{FE1}$</th>
<th>$h_{FE2}$</th>
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<tbody>
<tr>
<td>$H1$</td>
<td>8 ~ 17</td>
<td>15 ~ 28</td>
</tr>
<tr>
<td>$H2$</td>
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Typical Performance Characteristics

Figure 1. DC Current Gain

Figure 2. Base-Emitter Saturation Voltage and Collector-Emitter Saturation Voltage

Figure 3. Collector Output Capacitance

Figure 4. Turn-On Time

Figure 5. Turn-Off Time

Figure 6. Forward Bias Safe Operating Area
Typical Performance Characteristics (Continued)

Figure 7. Reverse Bias Safe Operating Area

![Reverse Bias Safe Operating Area Graph]

Figure 8. Power Derating

![Power Derating Graph]
Physical Dimensions

Figure 9. TO220, MOLDED, 3-LEAD, JEDEC VARIATION AB
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<th>Product Status</th>
<th>Definition</th>
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<td>Advance Information</td>
<td>Formative / In Design</td>
<td>Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
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<tr>
<td>Preliminary</td>
<td>First Production</td>
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